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present report is practically a series of explanatory sheets accompanying the maps, it being intended, after the survey of the entire region is completed, to publish two volumes summarizing the results, — one on descriptive, the other on systematic geology.

Besides the explanations of atlas sheets and sections, which will find ample criticism and verification at the hands of the multitude who will practically use them in the field, the volume contains some practical investigations into the character and composition of the different coals; the amount of coal already mined, and that which probably remains in the basin, not yet taken out; together with an elaborate description of the methods employed in preparing the various maps, and in obtaining these results.

In no scientific work is the personal equation of the observer so large as in geological investigation; and it would be well if all our geological workers felt as Mr. Ashburner does when he says, "In the case of a public survey, I believe that all the facts which are used in any investigation should be clearly stated, so that, from a personal examination of the subject by an expert, the results can be accepted with confidence, or can be rejected with reason."

In estimating the amount of commercial coal under a given area, Mr. Ashburner first develops each bed upon a horizontal plane, to obtain the actual area of the bed, and then calculates the average thickness of coal, not only from measured sections, but from practical results of shipment from different mines; he also wisely distinguishes the regular from the overturned dips, as the amount of marketable coal obtained from beds in the latter position is very much less than the average.

In comparing the thus calculated amount of coal originally contained in the Panther-Creek basin with the amount that has been taken out since the commencement of mining, in 1820, he finds that only twenty-seven per cent has been sent to market as fuel; while thirty-two went to the dirt-banks as refuse, and forty-one per cent was left in the mines for roof-supports, etc. A practical loss of seventy-three per cent of all the coal in a given bed seems much too large, and suggests wasteful methods of mining and preparing. That these have already been somewhat improved, is shown by the same figures for the years 1881 and 1882, when the percentages are respectively forty-six, twenty-four, and thirty, or a loss of only fifty-four per cent.

The fact that the analysis of bony coal taken from the dump of one of the collieries (p. 181)

gives a higher percentage of fixed carbon, and less ash, than the analyses of coal sent to market from the same colliery, would seem to suggest one way in which present processes might still be improved.

Mr. Ashburner recognizes the insufficiency of present methods of the analysis of coal as a means of determining its relative value as a fuel, and it is to be hoped that his future investigations will result in some practical improvement in them. In a paper in this journal (No. 58), he has already pointed out to its readers that the previously received estimate of the percentage of fixed carbon in anthracite is too high.

At the close of the chapter containing the many vertical sections obtained of the coal series, showing the respective coal-beds in each, Mr. Ashburner remarks, that no attempt has been made to systematize them, and that he believes that it would be impossible to do so. He then proceeds to point out some of the many inconsistencies in the existing nomenclature of coal-beds, but fails to note the reason for these inconsistencies. They arise from the assumption that a given coal-bed is continuous over the entire area of a basin; whereas the fact is, that, while a certain series of rocks may be regarded as coal-bearing throughout the basin, individual coal-beds are of only limited continuous extent; the coal having been formed in small, interrupted areas, not in one broad, contemporaneous sheet over the whole area.

The appendix contains a paper by Mr. Arthur Winslow, on the use of stadia measurements in surveying. This very simple, and by no means new, substitute for chaining, is, Mr. Ashburner remarks, not generally used by surveyors in the region; but we doubt, from what we know of the average surveyor, if Mr. Winslow's use of the calculus in its discussion will add as much to its favor in their eyes as the few practical tests which follow.

#### MINOR BOOK NOTICES.

*Logarithmisch-trigonometrische tafeln mit fünf decimalstellen.* Bearbeitet von Prof. Dr. TH. ALBRECHT, Sectionschef im königlichen preussischen geodätischen institut. Stereotypausgabe. Berlin, 1884. 16+172 p. 8°.

In *Science*, vol. ii. p. 174, the six-place tables of Dr. Albrecht were spoken of with the praise which they deserve. They will be found superior to any other six-place tables. It is harder to make an improvement in five-place tables, since we already have many excellent tables of this kind. But Dr. Albrecht

has made an improvement here, in the arrangement of the logarithms of numbers in single entry. The logarithmic sines and tangents are given for every second of arc up to  $3^{\circ} 0' 0''$ ; and the type of the main trigonometric table, together with its very convenient tables of proportional parts, makes this superior, on the whole, to any other similar one. A material improvement has also been introduced in the table of addition logarithms.

The formulæ at the end are convenient, and not superfluous. They are elegantly arranged (see the black-faced type on p. 157, for example), and are such as are always needed. The table of constants, as in his six-place tables, is very full and most practical. A few electrical data might, perhaps, have replaced Gauss' formula for the date of Easter with advantage. This is, no doubt, the very best five-place table for general use, and exactly suited for use with students.

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*Topographical surveying.* New York, D. Van Nostrand, 1884. (Van Nostrand science series, No. 72.) 210 p. 24°.

THE four papers which have been republished in this book, upon methods in surveying, more particularly adapted to topographical work, were first printed in *Van Nostrand's engineering magazine*. The one by George J. Specht explains the use of the stadia, with a telescope having additional horizontal wires, so that distances may be obtained without measurement. The application of photography to topographical surveying, as developed by the French engineers, so that the adjustment of two or more views of the same objects in a landscape to their proper positions on a sheet will enable these objects to be platted with their proper distances and elevations, is explained by Prof. A. S. Hardy. Applications of the geometry of position to some problems in surveying are given by John B. McMaster, — a method of solution which depends upon intersections of lines, and does not seem so convenient, expeditious, or accurate as other methods long and well known. The use of rectangular coordinates for the location and description of

points is urged and illustrated by Henry F. Walling. All of these papers are necessarily brief, but serve to give some useful hints to the topographer. A more careful proof-reading would save a young surveyor from a little perplexity in knowing what is meant by some statements.

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*Dynamic electricity, including, 1°, Some points in electric lighting, by Dr. JOHN HOPKINSON; 2°, On the measurement of electricity for commercial purposes, by JAMES N. SHOOLBRED; 3°, Electric-light arithmetic, by R. E. DAY.* New York, Van Nostrand, 1884. 4+167 p. 24°.

DR. HOPKINSON'S lecture before the Institution of civil engineers is an excellent treatment of the many analogies between the mechanical theory of electricity and the science of hydraulics. The student will find in this lecture a description of Maxwell's apparatus for illustrating the laws of induction, which has not found its way into any other treatise on electricity. A very pretty analogy between the action of the hydraulic ram and the extra current of induction is also given by Dr. Hopkinson. It is also shown how alternating dynamo machines can be run on the same circuit in order to assist each other, — a problem which has been considered by some unsolvable. The equations which illustrate the theory of the dynamo-electric engine are grouped together, and their practical use is shown. The author briefly refers to his improvements in the Edison dynamo, and gives an estimate of the cost of incandescent lighting. Dr. Hopkinson thinks that the efficiency of the carbon-filament lamp will be very much increased. These lamps have not been in the market more than three years, and it is reasonable to suppose that the coming three years will see great improvements in them. The prospect that the electrical incandescent light will be the light of the future seems a very good one.

The paper by Mr. Shoolbred gives an excellent account of the various meters invented by Edison, Sprague, Hopkinson, Boys, Ayrton and Perry, and others. Mr. Day's treatise on electric-light arithmetic is a useful one for the electrical engineer.

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## INTELLIGENCE FROM AMERICAN SCIENTIFIC STATIONS.

### GOVERNMENT ORGANIZATIONS.

U. S. geological survey.

*Division of chemistry.* — Prof. F. W. Clarke is examining a collection of waters from the Virginia hot

springs, and is also beginning a series of experiments upon the synthesis of silicates by the wet method. — Dr. T. M. Chatard has completed a research upon a new method of estimation of alkalis in silicate analyses.